Virtual Transformations: The Evolution of Publication Media

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ABSTRACT

This article examines the developing publication forms in the electronic environment in the light of recent critical perspectives on textuality, historical dimensions of technological change, and practical considerations of economic and political culture. The article suggests that the book will be significantly altered in the networked future—transformed into something new—but concludes that impediments to change are cultural—not economic or technological.

INTRODUCTION

In the 1977 film "Annie Hall," Woody Allen and Diane Keaton are standing in line for tickets to see the documentary movie "The Sorrow and the Pity" when a man behind them begins pontificating on movies and the media. When he incorrectly describes Marshall McLuhan's views on television as a "hot" medium, Allen can no longer take it. He turns to the viewer and says with exasperation, "Can you believe this?" The man demands equal time to express his opinions. When Allen dismisses him, saying he obviously knows nothing about McLuhan, the man responds that in fact he is an expert who teaches a course in "Television, Media, and Culture." Casually, Allen then says, "Well, I've got McLuhan right here," and produces him from behind a lobby billboard. McLuhan confirms Allen's opinion of the man. He says, "You don't know what you're talking about. How you got to teach anything is amazing." Allen says to the viewer: "If only life were like this."
“Annie Hall” is a movie that breaks the boundaries of convention. Combining isolated stand-up comedy routines with animation, cultural criticism, and a conventional love story, it exploits fully the visual medium, which is, in this case, also, in a sly way, the message. Looking back at the scene now, one might be tempted to describe it as an early example of “hypertext”—an electronic jump across the boundary of one medium to another, the source itself. Allen calls up McLuhan to annotate his “text.” McLuhan is a footnote but one that is more believable because the man himself is there—well, he is on the screen, a “virtual” authority. McLuhan must have relished doing the bit.

McLuhan’s (1962) book, *The Gutenberg Galaxy*, announced the end of print, which he characterized as a linear mode of communication emphasizing left-brain rationality. He described an emerging “electric” medium that “is not mechanical but organic and has little sympathy with the values achieved through typography, ‘this mechanical way of writing,’ as it was called at first” (p. 135). The impetus for McLuhan’s argument was television, which he described as “cool” because it “demands participation and involvement in depth of the whole being. It will not work as a background. It engages you” (p. 125). On the other hand, “hot” media, such as radio, fill in all the imaginative spaces. He saw in this new electric medium the potential to recapture the values of oral tribalized culture and to create a new global village based on intuitive right-brain behavior. Although *The Global Village*, his last book, was published posthumously in 1989, its argument is quintessentially of the 1960s, “the medium of the language itself as a public trust rather than of the reader as a private consumer” (McLuhan, 1962, p. 227).

A few years after *The Gutenberg Galaxy*, Jacques Derrida (1967) also declared emphatically, but more enigmatically (and to a much smaller audience), the death of the book. “The end of linear writing is indeed the end of the book,” even if “it is within the form of a book that the new writings literary or theoretical allow themselves to be, for better or for worse, encased” (p. 86). Although this sounds like a postmodern species of having it both ways, the futurist critic hedging his bets, all communication is certainly at some point encased for delivery. The question is whether a book is ever anything other than folded and bound pages filled with type.

Derrida and McLuhan were both insisting that multimedia culture requires new ways of thinking about text (and the meaning of text), and both were remarkably prescient in imagining the approaching communications revolution. Although Derrida was interested in text as an ontological category more culturally complex than McLuhan’s technology of print, his insights (as well as those of other cultural critics such as Roland Barthes) prepared the intellectual ground for questioning the sanctity of
the written word. The more widely read McLuhan captured a cultural restlessness that was about more than modes of communication. Although McLuhan was wrong about television (in itself) as the medium of the future—and his insights about television are not necessarily transferable to computer communications—he correctly identified the technological imperative as an important fact of Western culture—not only economic—life. Television definitely changed the way people experience the world. On the other hand, the printed word and the book appear to be very much alive.

It was once thought that microfilm would revolutionize print media and lead to the end, or at least to the transformation, of the book. In 1935, Eugene Power, the founder of University Microfilms, saw the potential of the technology to revolutionize the preservation and reproduction of manuscript and printed materials. Microfilm remains, however, an important storage technology that has never seriously challenged the dominance of print (and the failure of microfilm to affect the shape of the book is often used now as an argument for moderation in making predictions about the fate of print in the computer era).

Vannevar Bush, a former scientific advisor to President Franklin D. Roosevelt, envisioned in a 1945 article in *The Atlantic Monthly* one use for microfilm that has led to a completely new way of thinking about information and manipulating text in electronic networks. What Bush described in "As We May Think" was a desktop apparatus he called the "Memex," comprising a "slanting translucent screen on which material can be projected for convenient reading" (p. 107). It was "a device in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility. It is an enlarged intimate supplement to his memory" (pp. 106-07). Operated by levers, buttons, and a keyboard, and based on microfilm storage technology, the contraption was a model in mechanical form of the desktop computer as a medium for retrieving and viewing information. More than that, it allowed a reader to "add marginal notes and comments, taking advantage of one possible type of dry photography, . . . just as though he had the physical page before him" (p. 107). The idea is that of a "virtual" text. Essential to Bush's conception was the ability of the Memex to facilitate associative links among texts. "When numerous items have been thus joined together to form a trail . . . it is exactly as though the physical items had been gathered together from widely separated sources and bound together to form a new book" (p. 107). He developed the concept as a way of dealing with an explosion of information but, more importantly, he saw the Memex as a system that
works as the human mind works. In talking about existing methods of storing and classifying knowledge, Bush complained that "the human mind does not work that way" (p. 106). Rather, he said, it works by association, snapping from one idea "to the next that is suggested by the association of thoughts, in accordance with some intricate web of trails carried by the cells of the brain" (p. 106).

What Bush described is now known as "hypertext," a word first coined by Theodor Nelson in the 1960s. By that, Nelson explained in 1981, he meant "nonsequential writing—text that branches and allows choices to the reader, best read at an interactive screen. As popularly conceived, this is a series of text chunks connected by links which offer the reader different pathways" (as cited in Landow, 1994, p. 4). Although he based the concept on Vannevar Bush's work, he predicted its actualization in the new environment of electronic media. Nelson was frustrated by the inadequacy of books. In hypertext and hypermedia (a word he also coined), "he had the basis of a whole new type of publishing medium, one that would change the way books and other texts—indeed, all sorts of media—are produced and consumed. This new medium would become a text repository, even a vast database of the corpus of English literature, and it would be called Xanadu" (Woolley, 1992, p. 158).

Nelson confidently expected Xanadu to become operational in the early 1980s. This complete intellectual or knowledge environment embodied the New Left thought of the 1960s (as did McLuhan's vision of the new communications era). Nelson called on people to "imagine a new accessibility and excitement that can unseat the video narcosis that now sits on our land like a fog. Imagine a new libertarian literature with alternative explanations so that anyone can choose the pathway or approach that best suits him or her; with ideas accessible and interesting to everyone, so that a new richness and freedom can come to the human experience" (as cited in Landow, 1994, pp. 169-70).

Whether or not Nelson's vision of a new and freer society comes to pass simply because of a liberated literature, the concept of hypertext has radically altered the conceptual landscape, which now must be understood as fundamentally determined by the computer and electronic networks. As Bolter (1991) has written, the printed book "seems destined to move to the margin of our literate culture. . . . This shift from print to the computer does not mean the end of literacy. What will be lost is not literacy itself, but the literacy of print, for electronic technology offers us a new kind of book and new ways to read and write" (p. 2). The question addressed in this essay is whether computer technology will alter the traditional forms of communication dramatically enough to allow one to claim that something new has come into being. Does it suggest, in essence, a transformation so extensive that one might speak of the effective obsolescence of the book and other forms of print media?
Hypertext, many believe, is the essential characteristic of the new medium. Landow (1992), in his book *Hypertext: The Convergence of Contemporary Critical Theory and Technology*, argues that literary and cultural critics, as well as computer visionaries, agree that "we must abandon conceptual systems founded upon ideas of center, margin, hierarchy, and linearity and replace them with ones of multilinearity, nodes, links, and networks. Almost all parties to this paradigm shift, which marks a revolution in human thought, see electronic writing as a direct response to the strengths and weaknesses of the printed book" (p. 3). The essence of hypertext is its absence of center and hierarchy (which in the writings of Nelson, McLuhan, and others is also an attribute with political implications). In the hypertext landscape, all objects are of equal value and are equally accessible (as McLuhan himself was accessible to Woody Allen when he needed him). The only center is the actor/user/reader/voyager, a postmodern heroic figure who navigates independently and yet somehow according to the communal, even tribal, values of the World Wide Web of knowledge. In McLuhan's "Global Village," and in the land of hypertext, the specialist is no better than the amateur. In fact, the amateur is the only true inhabitant.

In *The Gutenberg Galaxy*, McLuhan (1962) traced the history of the shift from the hand-copied manuscript to the mass-produced printed book—two different modes of production—in light of television, which he saw as a medium as revolutionary as the printing press. He understood that wireless communication (the telegraph), the telephone, radio, and television had the potential to change fundamentally human modes of discourse. Print technology, he asserted, contains "a drive towards applied knowledge" (p. 214). The value of remote goals (the planning work of the specialist) is inseparable from print culture and the perspective and vanishing point organization of space that is part of it. The fact that no such organization of space or culture is compatible with electronic simultaneity is what has involved Western man in new anxiety for a century. In addition to the solipsism and solitude and uniformity of print culture, there is now the immediate electric pressure for its dissolution (p. 214).

The medium of television did not require application or any particularly useful goal. In a letter to Buckminster Fuller, McLuhan wrote that "content is greatly transformed by the new technology. . . . today the environment itself becomes the artefact" (Molinaro et al., 1987, p. 309). Or, as he also said more quotably, "the medium is the message" (McLuhan, 1964, p. 13).

McLuhan was talking about a broadcast medium, which is centrally organized (and scheduled) but has no effective borders. Thus, he
conceived of a global village— one large tribe of people united by the one-way reach of broadcast technology. The computer, however, is a narrowcast medium that may well in some sense link everyone (everyone who has a computer, that is)— but interactively. It creates not one global village but an infinite number of small communities, the smallest of which is one person before the illuminated screen. The computer universe does not have to be centrally organized and is accessed according to individual, not mandated, schedules or external stimuli. Content in this universe is transformed by the medium, which includes the audience.

In the years since McLuhan and Nelson imagined the products of electronic culture, the printed book has retained its hold on information. Book production has not only not decreased, it has increased. The printed word still dominates learning and communication despite the extraordinarily rapid development of the personal computer and electronic networks. But there do seem to be signs that the book's form is evolving in new directions made possible by the computer. Whether the printed book itself ends may be a less relevant question than how it is being transformed by new technologies. (It should be noted here that there is no particular reason to distinguish between book and journal modes of publication. In the electronic environment, one speaks simply of information clusters or, as Roland Barthes termed them, *lexias*.)

The personal computer and advanced information storage media have permitted the development of desktop (or laptop) publications that are clearly extensions of the traditional book in various ways. ("Desktop publishing," as a technical term, has come to mean primarily the use of personal computers to produce designed text for the production of books. Used in this way, computers have done nothing to alter the book artifact itself, although they have made the work of the traditional publisher easier and even more economical.) The computer has generated book-like products— information in fixed media— that begin to take advantage of the capabilities of the technology, even though these are presented as "books" on electronic platforms. CD-ROM publications, notably, can incorporate in one deep-storage device, text, images, film, and even "live" interviews that can be accessed through hypertext links quickly and easily. These publications are in relatively wide use. Dictionaries, encyclopedias, and other reference items are particularly suited to the medium. The number of CD-ROM drives in existence runs into the millions. Not surprisingly, one of the main types of CD-ROM publication is the computer game, which in earlier television-based forms (such as Nintendo) taught an entire generation to think about interactive media in a new way.

One of the most admired computer games is *Myst*, which draws the "user" into a sort of alternative reality. The game begins with a figure falling eerily through space. The player of the game becomes this fallen figure, who searches the island on which he or she lands for the explorer
and creator from another time who destroyed the mythical book of Atrus. Unlike other computer games, the player is also the point of view: one sees but is not seen. The player can manipulate a pointing finger on the screen in order to move in one direction or another. The player traverses the landscape at will, entering buildings, climbing stairs. The graphics are excellent, the environment strange. The search is accompanied by appropriate environment sounds and weird music.

The game comes with no instructions (although there is a manual the faint-hearted can buy) and only three “hints,” none of which tell the player what the object of the game is. The player has to record the clues found in a library, recovered pages of the lost book and, in other words, build up over time a mosaic of information that eventually leads to the solution. In this game there is no warfare. Players do not rely on weapons. They do not dodge evil creatures set on destruction. No one dies. Myst is a puzzle whose puzzle master is part of the puzzle itself. What it maps is a way of knowing that is distinctly different from that of the traditional world of learning. It creates a hypertext landscape in which links and process are as meaningful as the purpose of the search.

Games like Myst represent a distinctly new way of managing information in the electronic universe. Other CD-ROM publications present what some would call more useful content but in similarly random-access form. The Voyager publishing company has produced, with Robert Winter, a series of music guides that, when they first appeared, demonstrated powerfully the advantages of computer-based publications. The publications combine music with text, cultural context, history, and close readings in a flexible and interactive learning environment. The Way Things Work, a book originally written by David Macaulay and published a few years ago in traditional book form, has been remastered for CD-ROM by the publishing firm Dorling Kindersley in a publication that (as Garry Trudeau wrote in his New York Times Book Review notice) “with its whimsical interface, its crisp, refined animation and its highly accessible cross-referencing. . . is about as operationally elegant as CD-ROM format publishing gets. . . . it’s finally time to consider the gift of software” (Trudeau, 1994, p. 56).

In taking advantage of the visual and hypertext options of the medium, CD-ROM publications represent, without question, a new form of book. CD “jukeboxes,” such as those marketed by University Microfilms, allow libraries to make a variety of electronic databases and reference works available easily and virtually immediately to researchers. The University of Nebraska Press is developing a CD-ROM-based “Library of the Frontier” that will make available in one place the company’s extensive list of books on the American West, all of them connected by “pathways” that will link components across the boundaries of the previously separate publications. The Perseus Project, published by Yale University Press, was an early and impressive CD-ROM venture that explores the
world of classical Greece through linked texts and images. One can even “rotate” the image of a vase to see all sides of it on the computer screen. The National Gallery Collection on CD is a visual masterpiece that brings to the viewer’s desk a virtual museum. Andre Malraux’s “museum without walls”—and one might now include in that phrase “library without walls”—takes on an entirely new meaning in this electronic environment.

The CD-ROM technology represents in fixed form the direction in which computer-based publishing is going. It is a permanent addition to the publishing landscape. The reproductive technology itself is still evolving. The graphics are improving. The storage capacity of the CD is growing. The most interesting and exciting CDs have yet to be published. Although some have said that the CD-ROM is a transitional technology, that eventually it will give way to “online” network systems of information storage and retrieval, it seems likely that the desktop “on-demand” characteristics of the CD-ROM will encourage further development of the technology. Because it in so many ways mimics the portability and fixed qualities of the traditional book, and because it encourages private as well as library access, the CD-ROM promises to become a publishing medium of choice for the foreseeable future (limited for the present by relatively high development costs). It does more than a massive shelf of reference books can do, expanding and not simply replacing the information it holds. The multimedia potential of the technology is seemingly boundless.

The CD-ROM, in expanding the scope of the traditional book to include reader interaction, begins to look like something quite different. Taking this technology as the paradigm of electronic media, it is possible to imagine how other emerging communications systems will become equally compelling as computer and network platforms evolve. The sophistication of existing, albeit primitive, programs is already impressive (one must remember that personal computers have evolved to their present powerful state in less than fifteen years—and one writer has suggested that in a decade “we can start thinking of 1000 GB [gigabyte] storage devices for personal computers...” [Odlyzko, 1993, np]).

Some of the simplest publications are those that have transformed traditional books into diskette formats for storage on personal computer hard drives. The Voyager company’s “Expanded Book” program reproduces mostly previously published texts with a variety of hypertext enhancements. These publications permit full-text searches, annotations, underlining, bookmarks, and pop-up notes that are relatively simple extensions of the “normal” reading process. The expanded book does not transform the printed object so much as translate it into a computer binding. A computer that contains several of the Voyager books facilitates access to them, allowing the reader to carry in one laptop several texts at once—a portable library for
research, reference, and pleasure. These are still like traditional books, however, each of them bound by the parameters of the author's intentions. The hard drive is a kind of shelf on which they sit awaiting retrieval. When they are no longer needed or wanted, they can be easily removed—and later reloaded.

Another system known as DynaText is more interesting in that it begins to transform the book into something more complex. George Landow's book, *Hypertext*, referred to earlier, is also available in a diskette version, *Hypertext in Hypertext* (1994), which contains not only the text of the print version but also a library of relevant resources. The reader is able to "look up" additional information on subjects the author refers to in the course of his argument that might be unfamiliar. The reader can jump from topic to topic, following a thread of discourse different from that imposed by the author. The electronic version of the book contains reviews of the print edition as well as papers written by the author's students on various aspects of the book's argument. *Hypertext in Hypertext* thus nests in a web of references not unlike that the author brought to the writing of the book in the first place. One may explore, in a sense, his frame of reference without closing the book simply by "clicking" on a subject of interest and following the hypertext link wherever it leads. The originally "closed" text explodes in all directions at the reader's will. The reader is also able to make notations, record verbal observations, or create new links for later reference, thereby adding to the hypertext structure of the publication.

More like a CD-ROM, but without graphics, DynaText (and other programs similar to it) creates a new kind of book, one that carries with it resources that the traditional printed book must, of necessity, omit or refer to only obliquely in footnotes. Diskette-based books that can be stored and read on laptop computers allow the reader to access a virtual library not serially but simultaneously, making associational jumps from topic to topic, in a way that is likely to revolutionize the publishing of textbooks. The laptop computer becomes in itself a kind of book, containing in its hard drive constantly changing clusters of information organized hypertextually according to the reader's present interests or needs. A student might well carry in one laptop computer all of the texts needed for an entire semester's courses, including peripheral reference materials such as dictionaries, mathematical tables, and specific course requirements and syllabi. More advanced students with more powerful computers will be able to create their own hypertext links among clusters, all within the confines of a five-pound machine. Such electronic books already exist—although there are not yet many of them—and today's computers provide the environment in which entire learning systems can be created and manipulated by most students.

In a sense, hypertext publications are no longer news, as CD-ROM and diskette-based texts are in fact well understood and accepted, if not widely used. There are not yet that many publications, nor are people
used to thinking of their computers as books or book platforms. Most readers still say that computer screens are difficult or unpleasant to read. They maintain that people will never read real books on them. These are not problems intrinsic to the electronic book, however; they are problems of custom and the state of technology, both of which will undoubtedly be addressed in the near future. Certainly, the younger generation has less trouble reading on screen than those over the age of forty. Impediments to the development of books on fixed media include uncertainties about copyright, a subject beyond the scope of this article, and corresponding uneasiness among publishers about the economic prospects of electronic publications (one publisher suggested in a private conversation that all electronic media lead the user back to print). Nobody has to purchase a computer in order to read a traditionally published book nor must the publisher be concerned about system compatibilities or software bugs. These are not trifling issues. But there seems to be an inexorable movement toward more, not fewer, publications in electronic media, even among the most traditional of book publishers.

The Internet and other electronic networks promise to encourage forms of publication that will stretch even further the definition of "book." Moving beyond fixed media, network communications call into question many of the basic assumptions of print culture. Even a hypertext publication resident on one's personal computer is still an item fixed in place. There it is on the hard drive. Or there on the shelf is the envelope containing the diskette. Networks have developed simultaneously with fixed media, but there is no question that the potential for online publication is less well understood—and not only because of unresolved "revenue-stream" issues. It is in network publishing and retrieval systems that the most revolutionary new forms will emerge. In that environment, information structures might well alter totally the present concepts of publication, research, and authorship. Once fixed media are eliminated, even virtually, as they are online, the reader is adrift. Uneasiness and even panic sets in. One is seemingly at the mercy of vast systems over which no one has control. The telephone network is exactly like that, by the way, and no one minds.

When boundaries are eliminated, as they are on the Internet, the center truly is everywhere. On a fixed medium, such as a CD-ROM or an online magazine, the reader understands that the universe is curved. One will eventually come back to, for example, the table of contents. The Internet, on the other hand, is constantly buzzing with information, linked in often unexpected ways, mined with system crashes. A variety of easily manageable search engines now exist for Internet users—Gophers, the Mosaic interface for the World Wide Web, WAIS, and so forth. Bulletin board systems abound. Discussion lists are relatively easy to access. There is already a well-developed culture of the Internet, particularly in the aca-
demic community but increasingly in the commercial world as well. There are even online bookstores that supply electronic text as well as options for ordering printed objects.

What do people do on the Internet? They search for information in thousands of libraries and databases—and they talk. Electronic mail is probably as well accepted now as any other mode of communication (primarily in the West and especially in the United States). E-mail has made the Internet a friendly place for even the most inept computer user. It is a killer application, the one reason someone with a Royal manual typewriter might turn on the office computer. Chat is the commerce of the net. Bulletin boards and listservs are added daily, and many people think nothing of spending an hour or so every day surfing the chat lines. The Internet encourages a kind of Wild West atmosphere in which party lines cross, territories are unmarked, and anything (mostly) goes. These are only machines, and talk is cheap, if not free. The telephone encouraged a similar sense of the freedom to express oneself, but not (surprisingly) at first. In fact, in the beginning, back in 1876, “people thought [the telephone] was a device that would transmit news, drama, and music: the idea that the telephone was a way to talk to other people took about twenty years to sink in here, and about thirty years in Europe.” Seabrook (1994), the writer of a *New Yorker* article about Bill Gates, went on to say:

Similarly, today one hears about shopping, banking, and renting movies on the information highway. These are all possible ways of making money, of course, but the point of the information highway... is that it offers a new way of talking to other people. The trouble people have understanding this simple point is the same trouble people in the nineteenth century had understanding the telephone. (p. 49)

Seabrook is right about the talk potential of the Internet but wrong to say that people fail to understand and use it to chat. He is making a classic mistake about new media, one that McLuhan also identified. There is a tendency to think of new media as containers for old forms. People thought of telephones in the way they thought of newspapers. People think of the Internet in the way they think about telephones (and libraries).

McLuhan was right to identify the oral mode as one particularly congenial to the human animal. Most of the history of discourse has been oral, and the telephone certainly extended the capacity tremendously of people to talk to one another. The telephone, however, does what it does supremely well, and it is unlikely that typed conversations will replace speech, even though at the moment there is an enormous amount of keyboard chat on the wire. People like to talk. They like to be heard. The chat mode will undoubtedly be eclipsed by something else, for the
computer and its networks are not simply telephones attached to key-
boards. When people first acquired desktop computers, they used them
as typewriters and calculators. That is the normal course of technological
development. The news in the Internet is this (quoting Stewart Brand
virtual reality!):

Marshall McLuhan used to remark, "Gutenberg made everybody
a reader. Xerox made everybody a publisher." Personal comput-
ers are making everybody an author. . . . If, as alleged, the only
real freedom of the press is to own one, the fullest realization of
the First Amendment is being accomplished by technology, not
politics. In cyberspace, everyone is an author, which means that
no one is an author: the distinction upon which it rests, the au-
thor distinct from the reader, disappears. Exit author. . . . (p. 165)

To put this observation in perspective, listen to McLuhan (1967) on
the subject of authorship at the dawn of the age of print:

Authorship—in the sense we know it today, individual intellec-
tual effort related to the book as an economic commodity—was
practically unknown before the advent of print technology. . . .
The invention of print did away with anonymity, fostering ideas
of literary fame and the habit of considering intellectual effort
as private property. Mechanical multiples of the same text cre-
ated a public—a reading public. The rising consumer-oriented
culture became concerned with labels of authenticity and protec-
tion against theft and piracy. The idea of copyright. . . . was born.
(p. 122)

Just as the notion of "author" changed—or was created—with the shift
to print technology, so the notion is likely to be altered again in the elec-
tronic network environment, where the center is not the creator but the
user who manages content.

It is in the networks that the true revolution in the book form will
take place, but certainly over a relatively long period of time. Chat is not
publication, but already there are systems in development that are begin-
ning to incorporate talk as rudimentary forms of formal communication
that mimic authorship. H-Net, a collection of discussion lists for histori-
ans, has been conceived by historian Richard Jensen as the basis of a
history-publication network, although now it is merely a forum for aca-
demic chat. Eventually, in fact, the "H" in H-Net may be expanded to
stand for "humanities." Organizing networks for the future is the job of
the visionaries of today.

Information services are also important in networks, which allow fast
and geographically unlimited searches of online library catalogs, full-text
archives, and databases. Eventually, hypertext links in this virtual "library"
will further expand the concept of the book as, for example, DynaText already does on the personal computer or as Intermedia does at Brown. The World Wide Web already permits hypertext linkages and sophisticated interactive searching. In this environment, the reader or user is a navigator making brief visits to information sites and compiling, during the journey, a history that is uniquely personal. In a sense, one thereby compiles "books" that exist briefly in cyberspace and then disappear. (Some electronically published fictions literally disappear once they are read!)

Commercial networks supplying information are already relatively well established. PRODIGY, America Online, Delphi, and CompuServe provide extensive online services for subscribers. The CompuServe Information Service is the oldest of the major networks, and it contains a rich array of business, professional, and consumer information. The business of such services is supplying content in a user-friendly and attractive format. CompuServe can be accessed by a local phone call in more than 700 cities. It offers more than 1,000 different services to subscribers. One pays for this range of alternatives, of course. The commercial services are not the Internet, although increasingly they offer gateways to the net, which is characterized by its disorganized structure and cheap access. As contributors to the evolving form of publication, in the context of this article, such services are of no great importance. They are information access and, importantly, advertising systems (the Internet itself is increasingly of interest to commercial business). Information on networks is made available to the user who knows how to find it. Commercial systems make it easy but expensive; the Internet makes it more difficult but cheaper. Commercial services also de-emphasize the active role of the user/reader that is the essence of the Internet.

The World Wide Web embodies the first Internet framework for new publication form. Accessible through attractive graphical interfaces such as, notably, Mosaic, the Web is a hypertext-structured network that encourages users to jump from subject to subject across all boundaries linking texts and images that otherwise are simply holding in cyberspace (a word coined by the cyberpunk novelist William Gibson). It is the prototype of a future publication structure that will indeed make everyone simultaneously an author and a reader. The Web is, in effect, a gigantic CD-ROM accessible from any desktop computer anywhere in the world. The difference between the Web and a CD purchased from a publisher is that no one actually publishes the Web. It just is. One might add to it, but one cannot control or contain it. And the Web is not the last word on the subject; it is the beginning of the sentence. It is unlike commercial services in being unstructured and inexpensive to use; it is like them in opening the Internet to business exploitation. World Wide Web Home Pages have been described as storefronts in an information mall. PRODIGY has now added World Wide Web access to its system.
There are small webs in existence that suggest how publication media will change. The impact of these changes will be felt first in the academic environment, where electronic research systems are rapidly developing primarily, although not exclusively, in university libraries. At Brown University, the Intermedia system has been in place for several years (now supplanted by Storyspace). In this learning environment, texts are embedded in contextual networks that allow students to roam freely among linked *lexias*, independently creating, expanding, and adding to their instructional space. Created by George Landow and Paul Kahn, Intermedia was a true hypertext universe designed to teach students to think critically by making available to them the resources of an electronic library. One of the texts used in the system was Alfred Lord Tennyson's elegy, "In Memoriam," which because of its unusual form, lent itself especially to hypertext exploration. Landow describes this system in his book, *Hypertext*, and includes "screens" from the Intermedia program to illustrate the virtuosity of the system. The following is a description, accompanied in his book by a reproduction of the screen, of a snapshot from the *In Memoriam* Web:

The *In Memoriam ROM*. In this snapshot of a typical screen during a session on Intermedia, the active document, *In Memoriam*, section 7 ("In Mem 7"), appears at the lower left center of the screen with a darkened strip across its top to indicate its status. Using the capacities of hypertext to navigate the poem easily, a reader has juxtaposed sections 119 and 7, which echo and complete each other. The *In Memoriam* overview (IN MEMO OV), which appears at the upper left, is a graphic document that serves as a directory; it organizes linked materials under generalized headings, such as Cultural Context: Victorianism or "Images and Motifs." The *In Memoriam* imagery overview (IM IMAGERY OV), a second visual index document, overlies the right border of the overview for the entire poem. On the right appears the Web View, which the system automatically creates for each document as the document becomes active either by being opened or, if it is already open on the desktop, by being clicked upon. In contrast to the hierarchically organized overviews the author creates, the Web View shows titled icons representing all documents connected electronically to the active document, in this case section 7 of the poem. Touching any link marker with the arrow-shaped cursor darkens the icons representing the documents linked to it; in this case, the reader has activated the marker above the phrase "compared to 119" and thereby darkened icons representing both the text of section 7 and a student essay comparing it to section 119. (Landow, 1992, p. 39)

The Intermedia system is freely available to Brown University students taking the courses that require its use. There is no other program quite like it, but it represents a future in network publication.
and learning that is revolutionary. It changes the concept of "book" irrevocably by launching it into space, setting it free from the constraints of authorship and boundaries (although there are boundaries introduced by the designers, the user can still expand those boundaries by adding to the Web).

How do students experience this learning environment? Quoting Landow (1992) again:

For students, hypertext promises new, increasingly reader-centered encounters with text. In the first place, experiencing a text as part of a network of navigable relations provides a means of gaining quick and easy access to a far wider range of background and contextual materials than has ever been possible with conventional educational technology. . . . Even more important than having a means of acquiring factual material is having a means of learning what to do with such material once one has it in hand. Critical thinking relies upon relating many things to one another. Since the essence of hypertext lies in its making connections, it provides an efficient means of accustoming students to making connections. . . . (p. 126)

There are other programs now being published that take advantage of similar hypertext structures. W.W. Norton has created a "networked writing environment" with Myron Tuman and Ann Arbor Software that places the computer program in the university and markets access software to students, a more conventionally conceived textbook program that nonetheless expands the student's options into a cyberspace-like environment. "Connect," as the program is called, is a word processing system that allows the writer to share documents over a computer network, communicating, if one wishes, with an instructor electronically. The system encourages computer conferencing and other forms of electronic collaboration. It is a new kind of textbook. Although it arrives with traditionally printed manuals, the computer diskettes that reside on the student's desktop or laptop computer are the essence of the book. They connect the user to the centralized program through which all of the users may communicate. The result is an interactive teaching and learning environment.

It seems clear that one of the major benefits of computer networks is the sharing of information across geographical boundaries. Designing systems that take advantage of options to share information is the job of universities, libraries, and publishers. What results will not look like books but will contain information as well structured as book-form publications. Many people worry that network publications will be undisciplined, subject to uncontrolled manipulation, and ultimately unreliable. Certainly,
the present state of Internet communications leads one to think those fears might be well founded. The chat mode of discourse allows junk to accumulate even in moderated listservs. But systems can be devised and are being devised that will manage information for learning. These systems are like books but are not books.

Research publication will also be affected by computer and network systems. The venerable monograph, which has been for so long the measure of academic advancement in the humanities, will evolve in the electronic environment into more open-ended, less structured publications. The economic environment for the monograph is, to say the least, hostile. The form itself is the product of book and print culture, as this author has argued elsewhere (Arnold, 1993). The journal article is already undergoing transformation in the electronic environment. The Johns Hopkins University Press Project, Muse, by which print journals are being converted to online access, is a beginning that promises to open up the parameters of print dramatically. Articles can be published as they are written and accepted and can be downloaded by libraries for immediate local use. The project is still based on traditional publishing assumptions, but it will not be long before it begins to expand those assumptions into the capabilities of the medium. Postmodern Culture began life electronically and continues to evolve as an experimental publishing form, as does Psycoloquy, published by Stevan Harnad. Both journals are peer-reviewed online and allow for reader response on the network. These online journals replicate their print forebears but go beyond them in being interactive.

Digital libraries, which are coming into being at the University of Michigan, Columbia, Case Western Reserve, and elsewhere provide an environment for the development of university based "publications" that are in essence "live" research and learning environments without borders. These libraries, and the other evolving forms of academic publication mentioned earlier, open the realm of discourse to the nonspecialist in ways that scholars may find threatening. Certainly, it will be essential for universities in the not too distant future to begin to think of new ways to evaluate collaborative scholarly production in the humanities. The scientific community already works in a collaborative mode and, in many places, has already embraced the electronic networks as viable media for publication. The distinctions between academic discourse and chat may well begin to break down and the culture of literacy supported by the book may itself be altered in the network universe. This threat, if that is what it is, is felt most acutely by the humanists—scholars who, in the words of Lanham (1993), represent "the group still irrevocably committed to the printed word" (p. 755). Lanham goes on to say: "The academy cannot do business in a different expressive language, using a different definition of reason, than the world it serves. That expressive language is chang-
ing, and academic discourse must change with it” (p. 761). “The convergence of technology, democratization, and the return of rhetoric provides the dominant reality for the arts and letters of our time” (p. 775).

Lanham’s argument in his book *The Electronic Word* is based on the notion that the ancient discipline of rhetoric is the appropriate mode of discourse in the electronic environment. In so saying, he echoes the argument McLuhan made for a return to oral tribal culture in the electronic age. He also suggests, as McLuhan and Nelson did, that the shift in technology promises a shift in political as well as expressive culture from the hierarchical modes of print to the more horizontally organized universe of the computer network. If that is the case, then the book is indeed threatened because it depends entirely on the specialist, the authoritative voice, the interpreter who stands between reader and information.

Do forms of communication alter consciousness? There is some evidence that those who are concerned about the transformation of media in the electronic environment are worried about just that—relationships of ownership and power will change with the advent of a new technology. When there are no books in print, who will be in charge? For some, rationality itself is at stake. Technology has always had an impact on humanistic and critical discourse—even though such thinkers are notoriously technophobic (as they are now). Writing “began as the hieratic possession of the politically powerful” and printing “provides one of the first instances of production-line interchangeable parts used in heavily capitalized production [as McLuhan also argued]. Scholars and theorists today can hardly be Luddites, though they can be suspicious of the latest form of information technology, one whose advent threatens, or which they believe threatens, their power and position” (Landow, 1992, p. 168).

The issue of the transformation of print culture may indeed be more about power than it is about forms of communication. Inevitably, the computer and electronic networks will alter those forms. That is already happening. The political questions will be answered only in retrospect.

REFERENCES


